BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A and 1B are schematic section views showing an embodiment of a channel plate of the present invention;

FIG. 2 is an enlarged section view of a single channel comprising the channel plate of FIGS. 1A and 1B;

FIG. 3 is a schematic section view showing an embodiment of the channel plate of the present invention;

FIGS. 4A, 4B, 4C and 4D are diagrams showing manufacturing steps of the channel plate of FIGS. 1A and 1B; and

FIG. 5 is a slanted view of a conventional channel plate.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will be described in detail hereafter.

Channel plates of the present invention and a manufacturing method thereof will be described with reference to the drawings. Like portions in the drawings refer to the same reference symbols.

FIGS. 1A and 1B are illustrations showing an embodiment of the channel plate of the present invention, where FIG. 1A is a section view and FIG. 1B is a slanted view. As shown in FIGS. 1A and 1B, the

channel plate of this embodiment is comprised of a channel 2 wherein a substrate 1 and a pore 6 provided in the substrate 1 are placed, and an electron multiplier 3 for emitting a secondary electron due to collision of the electron is formed on an internal wall surface of the pore 6, and a cathode electrode 4 and an anode electrode 5 provided on the top face and on the bottom face of the substrate 1 respectively for the purpose of applying voltage to the electron multiplier 3. And it is characterized by the substrate 1 comprised of a compound including aluminum.

The compound including aluminum referred to here is primarily a compound such as aluminum oxide, aluminum hydroxide, hydrate and so on generated from aluminum in an aqueous solution. As a matter of course, it may be a mixture of a plurality of these compounds. Moreover, in the case where a porous element is primarily composed as the aluminum oxide, the element is substantially an insulating substrate.

In addition, electron multipliers are placed on the internal wall surfaces of a plurality of pores, thus forming a so-called electron multiplier surface in a channel plate. It is desirable that the electron multiplier surface has oxide grains. This configuration increases microscopic asperities on the face of the electron multiplier surface and its surface area becomes larger than an even surface so that a

secondary electron multiplication factor can be improved.

Moreover, a method of manufacturing the channel plate of the present invention is characterized by forming the wall surface of the channel by anodizing the aluminum.

In addition, it is characterized by having the steps of: anodizing in a solution the substrate of which main ingredient is aluminum to form a plurality of pores; having the pores extend through the substrate; coating the internal surfaces of the pores with high secondary electron emission material; and forming the electrodes on both faces of the substrate on which the pores are formed respectively.

Furthermore, it is characterized by the substrate of which main ingredient is aluminum being an aluminum film placed on the electrode to be anodized.

If an aluminum plate is anodized in the present invention, an anodic oxide alumina layer that is a porous anodic oxide film is formed. This porous film is characterized by having a unique geometrical structure wherein extremely minute columnar pores (nanoholes) of which diameter is between several nm and several hundreds nm are arranged in parallel with spacing of several tens of nm to several hundreds nm. These columnar pores have a high aspect ratio and also good uniformity of sectional diameters.